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(71)出願人 000005223

富士通株式会社

神奈川県川崎市中原区上小田中1015番地

(72)発明者 袴谷 隆夫

神奈川県川崎市中原区上小田中1015番地

富士通株式会社内

(72)発明者 手冢 ▲廣▼司

神奈川県川崎市中原区上小田中1015番地

富士通株式会社内

(74)代理人 弁理士 伊東 忠彦

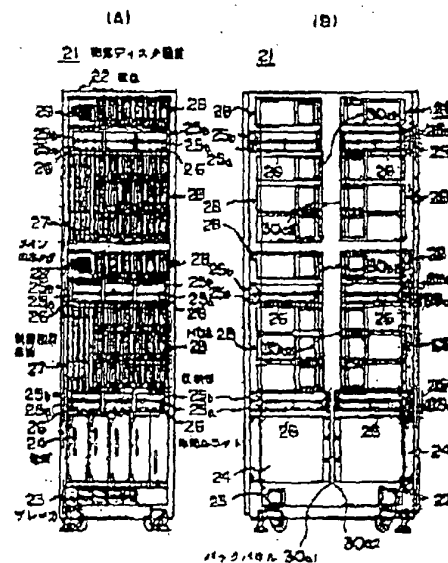
(54)【発明の名称】 冷却構造の電子装置

(57)【要約】

【目的】 本発明は冷却の冗長構成を備えた冷却構造の電子装置に関し、冷却能力を低下させることなく冷却ユニットを交換可能とすることを目的とする。

【構成】 冷却エアの流通方向の縦方向に配設された電源24、制御回路基板27、HDA28の間に、縦方向に2つの収納部25a、25bを所定数配置し、収納部25a、25bに冷却ユニット26を冷却動作を停止させずに交換自在に収納する構成とする。

本発明の一実施例の構成図



(6)

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10

53 a, 53 b 蓋部
 54 a, 54 b パネ
 55 開口部
 61 冗長回路
 62 回転パルス検出回路

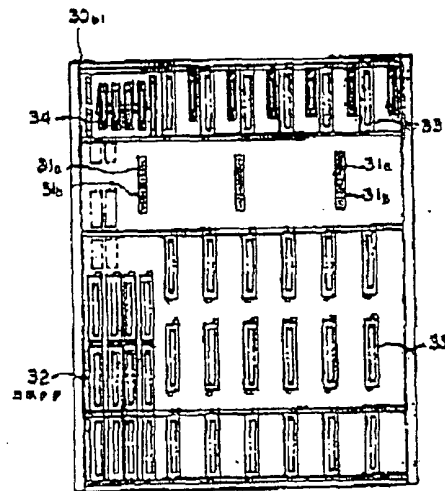
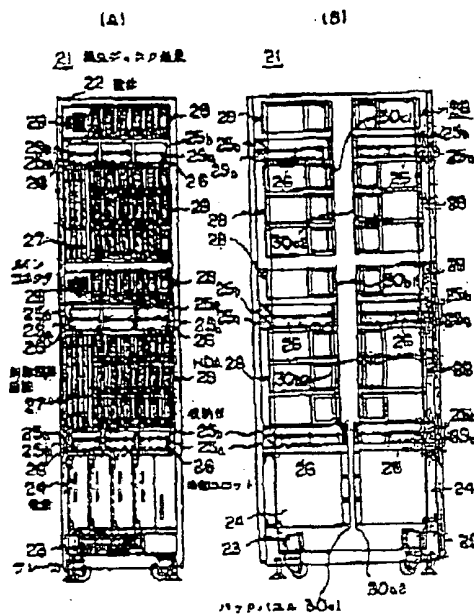
63 計数回路
 64 比較回路
 65 タイマ
 66 回転制御回路
 67 状態表示回路

【図1】

【図2】

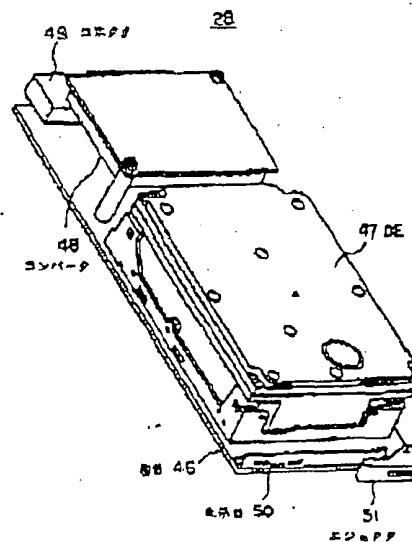
本発明の一実施例の構成図

図1のペリパシタルの構成図



【図4】

図1のHDAの構成図



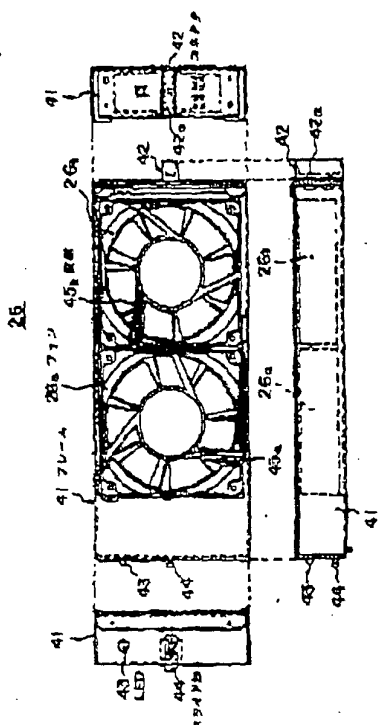
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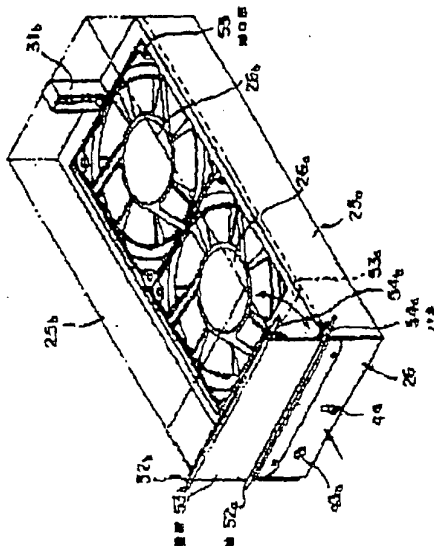
【図 3】

図 1 の冷却ファンユニットの構成図



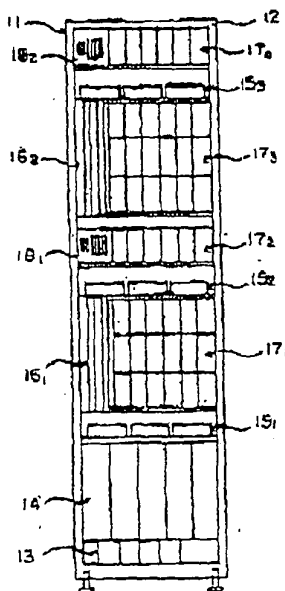
【図 5】

図 1 の冷却ファンユニットの構成図



【図 6】

従来の冷却ファンユニットの構成図



PATENT ABSTRACTS OF JAPAN

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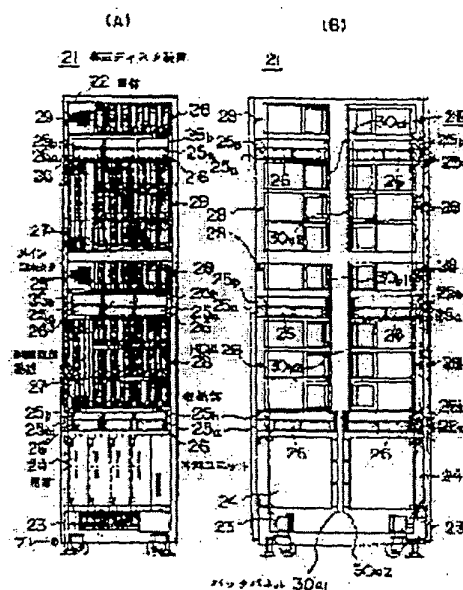
(72)Inventor : HAKAMADANI TAKAO
UNO KOJI

(54) ELECTRONIC APPARATUS OF COOLING STRUCTURE

(57)Abstract:

PURPOSE: To be able to replace a cooling unit without reducing cooling capacity in an electronic apparatus of a cooling structure having a redundant structure of cooling.

CONSTITUTION: Two longitudinal containers 25a, 25b of predetermined number are disposed among a power source 24 disposed longitudinally of the flowing direction of cooling air, a control circuit board 27 and an HDA 28, and can be replaceably contained in the containers 25a, 25b without stopping the cooling operation of a cooling unit 26.



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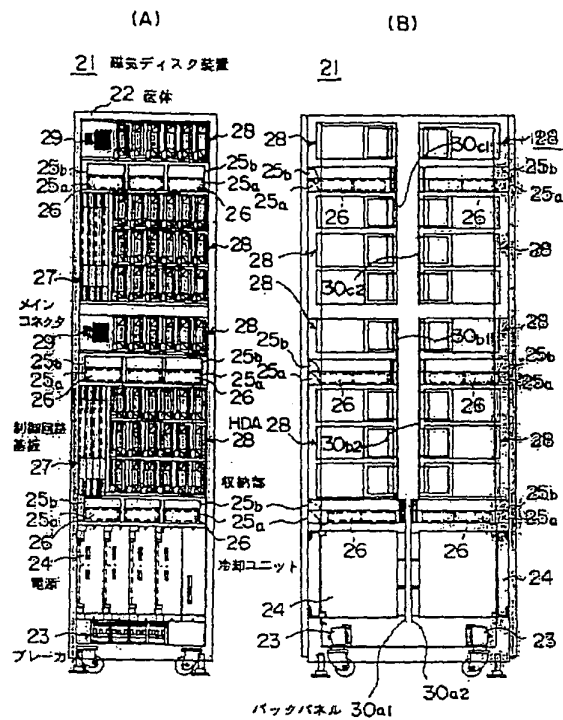
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Drawing selection

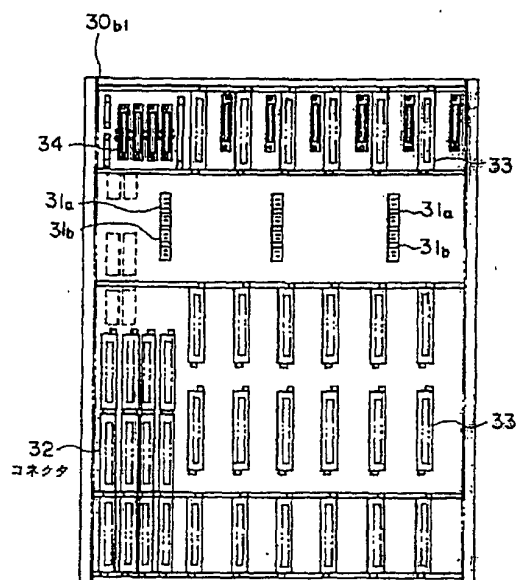
本発明の一実施例の構成図



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Drawing selection

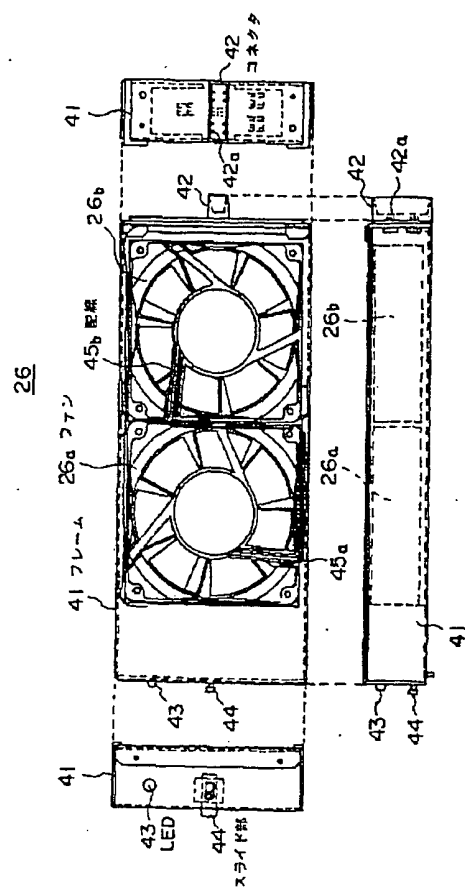
図1のバックパネルの構成図



[Translation done.]

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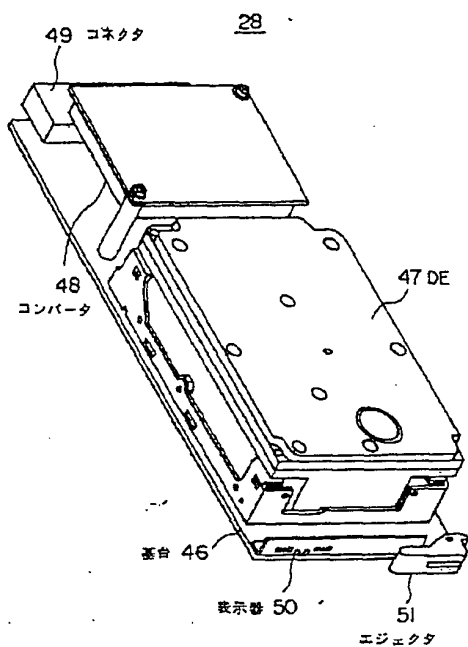
図1の冷却ユニットの構成図



[Translation done.]

Drawing selection drawing 4

図1のHDAの構成図



[Translation done.]


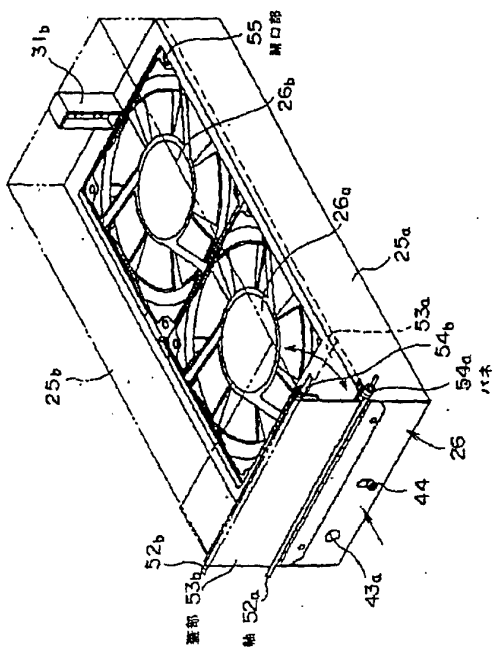
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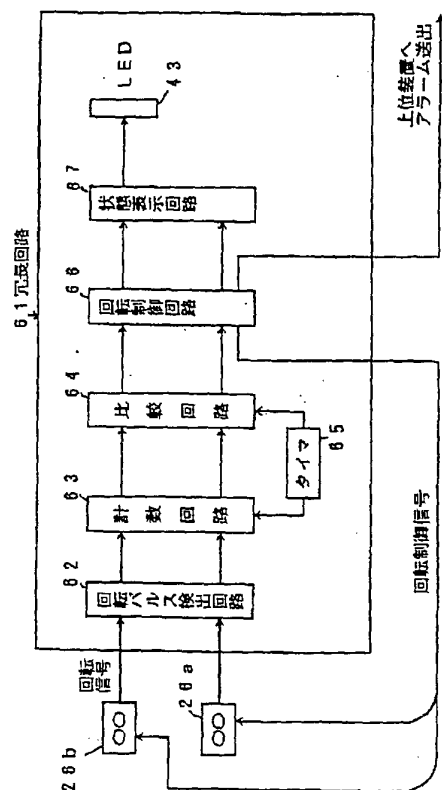
図1の収納部の構成図



[Translation done.]

Drawing selection drawing 6

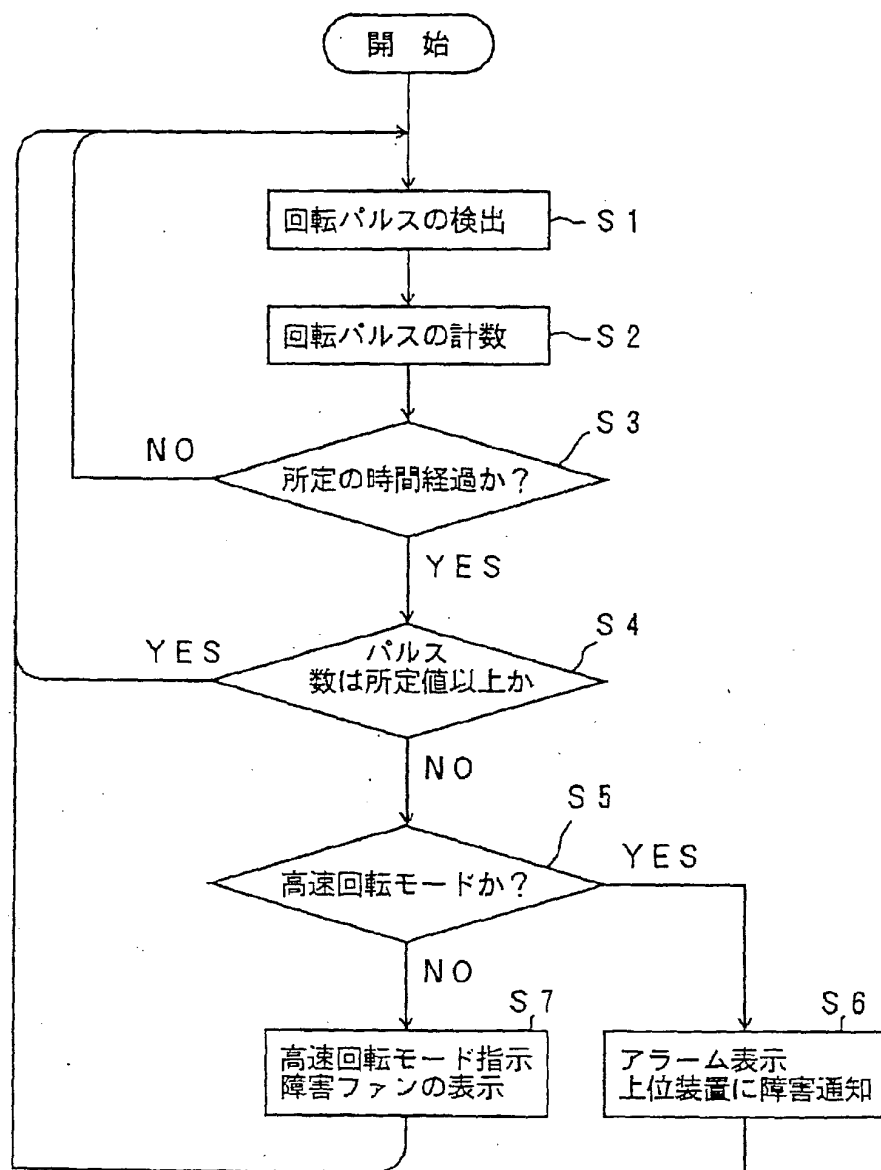
ファンの冗長の回路ブロック図



[Translation done.]

Drawing selection drawing 7

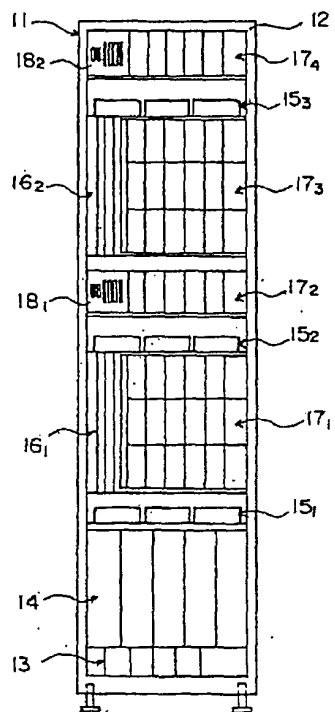
図 6 の冗長回路動作のフローチャート



[Translation done.]

Drawing selection

従来の磁気ディスク装置のファンユニット取付構造の構成図



[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] The electronic instrument of the cooling structure characterized by preparing two or more stowages which contain the aforementioned cooling unit to the aforementioned cooled section in the electronic instrument of the cooling structure where the cooling unit equipped with the cooling object which cools to the cooled section has been arranged.

[Claim 2] Two or more stowages according to claim 1 are the electronic instruments of the cooling structure characterized by other cooling units being contained by other stowages at the time of exchange of the aforementioned cooling unit.

[Claim 3] Two or more stowages according to claim 1 or 2 are the electronic instruments of the cooling structure characterized by being prepared in the circulation direction of the cooling medium of the aforementioned cooling unit at intervals of predetermined.

[Claim 4] Two or more stowages according to claim 3 are the electronic instruments of the cooling structure characterized by fastening the aforementioned cooled section and being prepared.

[Claim 5] Two or more stowages given in any 1 term of claims 1-4 are the electronic instruments of the cooling structure characterized by preparing the covering device which closes a receipt mouth at the time of un-containing [of the aforementioned cooling unit].

[Claim 6] The electronic instrument of the cooling structure characterized by preparing the 1st coupling means which perform the aforementioned cooling unit and electrical installation to each of two or more stowages given in any 1 term of claims 1-5, and preparing these 1st coupling means and the 2nd coupling means which perform electrical installation free [attachment and detachment] in this cooling unit.

[Claim 7] A cooling unit according to claim 1 is the electronic instrument of the cooling structure characterized by preparing the display which displays at the time of failure of the aforementioned cooling object.

[Claim 8] The electronic instrument of the cooling structure characterized by establishing two or more aforementioned cooling objects which can be set to a cooling unit according to claim 1 or 7, and preparing the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of at least 1.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the electronic instrument of the cooling structure equipped with the redundant configuration of cooling.

[0002] A magnetic disk unit is used as external storage which makes the system file and data file of recent years, for example, an electronic computer system, memorize, and a magnetic disk unit is being enlarged from increase of storage capacity. Therefore, if the temperature in a magnetic disk unit rises unusually, it is necessary to cool by damaging a head disk assembly (HDA), a control circuit, a power supply, etc.

[0003]

[Description of the Prior Art] The block diagram of the fan unit attachment structure of the conventional magnetic disk unit is shown in drawing 8.

[0004] Two or more magnetic disk units 11 shown in drawing 8 are carried according to scales, such as HDA, a control circuit substrate, and a power supply, in the housing 12, the breaker 13 for two or more protection is arranged at the bottom of a housing 12, and two or more power supplies 14 are arranged on a breaker 13. Fan unit 151 equipped with the cooling fan for cooling the power supply 14 concerned on a power supply 14 Predetermined-number arrangement is carried out.

[0005] Fan unit 151 Two or more control circuit [upper part] substrate 161 It sets in each stage in three steps, and is two or more HDA171. Fan unit 152 for being arranged and cooling these on this It is arranged. Fan unit 152 In the upper part, it is one step of HDA172. Connector 181 for connection with host equipment While being arranged, it is the control circuit substrate 162 of plurality [upper part / this]. It sets in each stage in three steps, and is two or more HDA173. It is arranged and is the fan unit 153 of plurality / top / these]. It is arranged.

[0006] And fan unit 153 In the upper part, it is a connector 182. One step of HDA174 It is arranged.

[0007] On the other hand, it is the composition of a field, and is arranged with the same composition also as an opposite side, and drawing 8 is [which detaches and attaches HDA17 and the control circuit substrate 16] the fan unit 151-153. From rotation, cooling air flows caudad from the equipment upper part, and cools HDA 171-174, the control circuit substrate 161, 162, and a power supply 14.

[0008]

[Problem(s) to be Solved by the Invention] However, fan unit 151-153 It must exchange for the life by wear of a bearing etc., or failure, in order to make it stop at the time of failure and exchange, the capacity of cooling of equipment declines, and the cooling fan to constitute is HDA 171-174, the control circuit substrate 161, and 162. And there is a problem that there are an injury and a case where life shortening is carried out, about power supply 14 grade.

[0009] By the way, although the thing of the redundant configuration which is the thing of another side and compensates one failure with two cooling fans in preparation for a fan unit as a method of making other cooling fans operating and preventing the fall of refrigeration capacity is known to failure of a cooling fan, at the time of exchange of a fan unit, a normal cooling fan will also be exchanged in this

case, and since it is made to stop, there is a problem of causing the fall of refrigeration capacity.

[0010] Then, this invention was made in view of the above-mentioned technical problem, and it aims at offering the electronic instrument of the cooling structure which makes a cooling unit exchangeable, without reducing refrigeration capacity.

[0011]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, in the electronic instrument of the cooling structure where the cooling unit of the predetermined number equipped with the cooling object which cools to the cooled section has been arranged, the electronic instrument of the cooling structure characterized by preparing two or more stowages which contain the aforementioned cooling unit to the aforementioned cooled section consists of claims 1.

[0012] In a claim 2, other cooling units are contained in the stowage of others [stowages / two or more / according to claim 1 / time / of exchange of the aforementioned cooling unit].

[0013] In a claim 3, two or more stowages according to claim 1 or 2 are prepared in the circulation direction of the cooling medium of the aforementioned cooling unit at intervals of predetermined.

[0014] In a claim 4, two or more stowages according to claim 3 fasten the aforementioned cooled section, and are prepared.

[0015] In a claim 5, the covering device with which two or more stowages given in any 1 term of claims 1-4 close a receipt mouth at the time of un-containing [of the aforementioned cooling unit] is prepared.

[0016] In a claim 6, the 1st coupling means which perform the aforementioned cooling unit and electrical installation to each of two or more stowages given in any 1 term of claims 1-5 are prepared, and these 1st coupling means and the 2nd coupling means which perform electrical installation free [attachment and detachment] are prepared in this cooling unit.

[0017] In a claim 7, the display as which a cooling unit according to claim 1 displays it at the time of failure of the aforementioned cooling object is prepared.

[0018] In a claim 8, two or more aforementioned cooling objects which can be set to a cooling unit according to claim 1 or 7 are established, and the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of at least 1 are prepared.

[0019]

[Function] As mentioned above, in invention of claims 1-3, two or more stowages which contain other cooling units at the time of exchange of the cooling unit concerned are prepared in the circulation direction of a cooling medium in a cooling unit to the cooled section. By this, cooling of the cooled section by the cooling unit is made to continue, exchange is performed, and it becomes possible to prevent the fall of refrigeration capacity.

[0020] In invention of a claim 4, two or more stowages fasten the cooled section in the circulation direction of a cooling medium, and are prepared. This becomes possible to prepare a stowage easily to the composition section of equipment.

[0021] In invention of a claim 5, the covering device which closes a receipt mouth at the time of un-containing [of a cooling unit] is prepared in a stowage. This becomes possible to prevent the invasion of the dust from a receipt mouth at the time of un-containing [of a cooling unit].

[0022] Invention of a claim 6 is made to perform electrical installation free [attachment and detachment] by the 1st bond part prepared in the stowage, and the 2nd bond part prepared in the cooling unit. This becomes possible to contain a cooling unit easily to a stowage.

[0023] In invention of a claim 7, the display which displays failure of a cooling object on a cooling unit is prepared. This becomes possible to check the exchange part of a cooling unit easily.

[0024] In invention of a claim 8, the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of 1 of a cooling unit are prepared. Thereby, even if the cooling object of 1 breaks down, it becomes possible to prevent the fall of refrigeration capacity.

[0025]

[Example] The block diagram of one example of this invention is shown in drawing 1. Drawing 1 (A) is the transverse-plane block diagram of the magnetic disk unit as an electronic instrument of cooling structure, and drawing 1 (B) is a flank block diagram. On the other hand, in a field, predetermined-

number arrangement of the breaker 23 for electrical power system protection is carried out at the bottom of a housing 22, and, as for the magnetic disk unit 21 shown in drawing 1 (A), predetermined-number arrangement of the power supply 24 which is the cooled section is carried out in the upper part.

According to the scale, a number proper setup of a breaker 23 and the power supply 24 is carried out. [0026] On a power supply 24, two steps of stowages 25a and 25b are formed successively by lengthwise [which is the circulation direction of a cooling medium], and predetermined-number arrangement of these two stowages 25a and 25b is carried out horizontally. And the cooling unit 26 (it explains in drawing 3) is contained by either of each stowages 25a and 25b for example, at stowage 25a.

[0027] Moreover, the control circuit substrate 27 which is the cooled section of a predetermined number above the stowages 25a and 25b, and HDA28 (it explains in drawing 4) which is the cooled section of a predetermined number horizontally in three steps are arranged. Besides, two stowages 25a and 25b are established in lengthwise, predetermined-number arrangement of these is carried out horizontally, and the cooling unit 26 is contained by the section at each stowage 25a.

[0028] Furthermore, in the direction of these stowages 25a and 25b, HDA28 of a predetermined number is horizontally arranged in one step with the main connector 29 which is the cooled section for connecting with host equipment.

[0029] Similarly, the control circuit substrate 27 of a predetermined number and HDA28 are arranged in the main connector 29 and each upper part of HDA28, and while the stowages 25a and 25b where the cooling unit 26 was contained by the upper part at one side are arranged, the main connector 29 and HDA28 are arranged further in the upper part.

[0030] For example, at this example, in the power supply 24 of four trains, and each stage, horizontally, it is configured by the control circuit substrate 27 of four trains (12 sheets) in the stowages 25a and 25b of three trains, and each stage, and is configured in each stage HDA28 of six trains, respectively.

[0031] As shown in drawing 1 (B), by the way, to a part for the abbreviation center section of a housing 23 Six back panels 30 (30a1, 30a2, 30b1, 30b2, 30c1, 30c2) are arranged. a back panel 30a1 and 30a2 **** -- the connector (female side) which performs electrical installation with the cooling unit 26 and plug-in within a power supply 24 and stowage 25a, and 25b is prepared, respectively (it mentions later) other back panels 30b1, 30b2, 30c1, and 30c2 **** -- the cooling unit 26, the control circuit substrate 27, HDA28, the main connector 29, and the connector (male side) that performs electrical installation with plug-in are prepared, respectively [moreover,]

[0032] That is, on the other hand, the thing to a field (drawing 1 (A)) and the thing to an another side side are prepared, the thing of the same composition as drawing 1 (A) is arranged in an another side side, and a back panel 30 has a magnetic disk unit 21 constituted.

[0033] Here, the block diagram of the back panel of drawing 1 is shown in drawing 2 . It is what showed the back panel 30b1 (the same except 30a1 and 30a2) of drawing 1 , the connectors (female side) 31a and 31b which are the 1st coupling means of every each stowage 25a corresponding to the cooling unit 26 and 25b are horizontally formed in three trains in two steps, and, as for drawing 2 , the connector (female side) 32 (three-step four trains) corresponding to the control circuit substrate 27 is formed. The connector (female side) 33 corresponding to HDA28 of three-step six trains is formed near the connector 32. Furthermore, the connector (female side) 34 corresponding to the main connector 29 and the connector (female side) 33 corresponding to HDA28 of one-step six trains are formed in connector 31a and 31b upper part.

[0034] That is, electrical installation is performed for the cooling unit 26, the circuit board 27, HDA28, a main connector, etc. to these connectors by plug-in.

[0035] Then, the block diagram of the cooling unit of drawing 1 is shown in drawing 3 . The connector (male side) 42 whose fans 26a and 26b whose cooling units 26 shown in drawing 3 are two cooling objects in a frame 41 are the 2nd coupling means which it was arranged at the coplanar and contact pin 42a projected to the inner is formed. Electrical connection of the attachment and detachment of a connector 42 is made free to Connectors 31a and 31b. For example, DC brushless motor is used and, as for Fans 26a and 26b, speed control is suitably performed by the control section (it mentions later).

[0036] Moreover, while Light Emitting Diode (light emitting diode)43 which is the display which

displays at the time of which fans' 26a and 26b failure was formed, when it contains to Stowages 25a and 25b, it escapes in the front face of a frame 41, and the stopper section 44 for prevention is formed in it. In addition, the wiring 45a and 45b of Fans 26a and 26b is connected to contact pin 42a of a connector 42 along with a frame 41.

[0037] This cooling unit 26 forms two fans 26a and 26b as a redundant configuration. For example, by rotating fan 26b of another side at the time of failure, or rotating one fan 26a, carrying out low-speed rotation of the two fans 26a and 26b, and considering another side as high-speed rotation at the time of one failure The fall of the refrigeration capacity in the equipment at the time of one failure is prevented. In addition, control of a redundant configuration is explained in drawing 6 and drawing 7.

[0038] Moreover, the block diagram of HDA of drawing 1 is shown in drawing 4. drawing 4 -- setting -- HDA -- 28 -- a pedestal -- 46 -- a top -- a rolling mechanism -- rotating -- a record medium -- a magnetic disk -- and -- record -- the reproducing head -- having carried -- an actuator -- a mechanism -- having -- disk enclosure -- (-- DE --) -- 47 -- fixing -- having -- while -- a drive -- an electrical power system -- conversion -- carrying out -- a converter -- 48 -- fixing -- having.

[0039] The connector 49 which carries out plug-in to the connector 33 of a back panel 30, and performs electrical installation to a part for the inner of a pedestal 46 is formed, and the ejector 51 when taking out the predetermined drops (for example, an error message, a preparation display, etc.) 50 and this HDA28 from a housing 22 into the front portion of an opposite portion is formed.

[0040] Then, the block diagram of the stowage of drawing 1 is shown in drawing 5. In drawing 5, it will be in the state where the amount of the inner is a back panel 30, and Connectors 31a and 31b projected Stowages 25a and 25b inside. Moreover, the covering devices 53a and 53b which can be rotated freely are attached to Shafts 52a and 52b, and a front portion is energized in the direction in which covering devices 53a and 53b close a receipt mouth with Springs 54a and 54b. This has prevented the invasion of the dust to stowage 25b by which the cooling unit 26 is not contained. Furthermore, as for Stowages 25a and 25b, opening 55 is formed in the field (the upper surface and base) where lengthwise (the circulation direction of cooling air) counters.

[0041] In drawing 5, it is in the state which contained the cooling unit 26 to stowage 25a, and covering device 53a has been pushed up and the front portion of the cooling unit 26 will be in the state where it displayed from the receipt mouth of stowage 25a. At this time, connector 31a of a back panel 30 and the connector 42 of the cooling unit 26 will be in an integrated state, and electrical installation is performed.

[0042] In such a state, it is the redundant configuration which is made to carry out high-speed rotation of the normal fan 26b of another side, and aims at maintenance of refrigeration capacity if one fan 26a breaks down while [when two fans 26a and 26b are operated normally (low-speed rotation), for example,] Light Emitting Diode43 will light up. And after making stowage 25b contain the normal cooling unit 26 and making it operate, it can exchange easily by stopping and taking out the current supply to the cooling unit 26 which has failure fan 25a, without reducing refrigeration capacity.

[0043] Then, a fan's redundant circuit block diagram is shown in drawing 6. In the redundant circuit 61 shown in drawing 6, Fans' 26a and 26b rotation signal is inputted into the rotation pulse detector 62, and the pulse detected here is inputted into a counting circuit 63. The enumerated data of a counting circuit 63 is inputted into a comparator circuit 64, and compares a reference value by the comparator circuit 64. In this case, as for a counting circuit 63 and a comparator circuit 64, only the time set up by the timer 65 performs counting and comparison.

[0044] The comparison result of a comparator circuit 64 is sent to the roll control circuit 66, and when one fan 26a (26b) has produced failure, Light Emitting Diode43 of the cooling unit 26 concerned is made to turn on through the status-display circuit 67, and a roll control signal is sent out in the roll control circuit 66 so that rotation of normal fan 26b (26a) may be raised.

[0045] Here, the flow chart of redundant circuit operation of drawing 6 is shown in drawing 7, and it explains to it with drawing 6. In drawing 6 and drawing 7, first, as shown in drawing 5, the cooling unit 26 is contained by stowage 25a, both two fans 26a and 26b are operated by low-speed rotation, each rotation signal of each fans 26a and 26b at this time is inputted into the rotation pulse detector 62, and detection of a rotation pulse is performed (Step 1 (S)).

[0046] And counting of the detected rotation pulse is carried out by the counting circuit 63 (S2), and the enumerated data is compared with a reference value (criteria rotational frequency) by the comparator circuit 64. in this case, the timer 65 -- a counting circuit 63 -- fixed time (for example, 1 second) -- counting -- it is made to operate and comparison operation is carried out by the comparator circuit 64 after fixed time progress

[0047] Then, in a comparator circuit 64, when predetermined time has not passed, it returns to S1, and when having passed, an enumerated data is compared with a reference value about each of Fans 26a and 26b (S3). When both rotation pulse numbers are beyond predetermined values as a result of comparison, which fans 26a and 26b are normal, and pulse detection of the rotation pulse detector 62 is continued (S4).

[0048] Here, since the rotational frequency of fan 26a will fall supposing it produces failure in fan 26a, in a comparator circuit 64, the enumerated data of a detection pulse becomes smaller than a reference value, and the result is sent to the roll control circuit 66 (S4).

[0049] In the roll control circuit 66, Light Emitting Diode43 is made to turn on through the status-display circuit 67 by making normal fan 26b into high-speed rotation mode, and an obstacle fan is displayed (S7). Fan 26b sends out the signal of the purport which should indicate by alarm to high order equipment, when failure arises in high-speed rotation mode (S6).

[0050] Then, if Light Emitting Diode43 lights up, after making stowage 25b contain the cooling unit 26 equipped with the normal fans 26a and 26b as mentioned above and operating, it exchanges by removing the cooling unit 26 equipped with fan 26a which failure produced.

[0051] And even if the above thing is repeated on stream and a magnetic disk unit 21 has an obstacle to Fans 26a and 26b, the cooling unit 26 can be exchanged easily, without reducing refrigeration capacity.

[0052] In addition, when working by making it stop at the time of the scheduled maintenance of a magnetic disk unit 21, you may contain the cooling unit 26 to exchange to the same stowages 25a and 25b.

[0053] By the way, although the above-mentioned example shows the case where made Stowages 25a and 25b approach, and they are prepared, a predetermined distance may be had and established, and the control circuit substrate 27 and where HDA28 is fastened, you may prepare.

[0054] Moreover, although the above-mentioned example showed the case where it applied to a magnetic disk unit 21, it is applicable to the required electronic instrument of not only this but cooling.

[0055]

[Effect of the Invention] As mentioned above, according to invention of claims 1-3, by preparing two or more stowages which contain other cooling units at the time of exchange of the cooling unit concerned in a cooling unit in the circulation direction of a cooling medium to the cooled section, cooling of the cooled section by the cooling unit is made to continue, exchange is performed, and the fall of refrigeration capacity can be prevented.

[0056] According to invention of a claim 4, a stowage can be easily prepared to the composition section of equipment by two or more stowages' fastening the cooled section in the circulation direction of a cooling medium, and preparing them.

[0057] According to invention of a claim 5, the invasion of the dust from a receipt mouth can be prevented at the time of un-containing [of a cooling unit] by preparing in a stowage the covering device which closes a receipt mouth at the time of un-containing [of a cooling unit].

[0058] According to invention of a claim 6, a cooling unit can be easily contained to a stowage by making electrical installation perform free [attachment and detachment] by the 1st bond part prepared in the stowage, and the 2nd bond part prepared in the cooling unit.

[0059] According to invention of a claim 7, the exchange part of a cooling unit can be easily checked by preparing the display which displays failure of a cooling object on a cooling unit. According to invention of a claim 8, by preparing the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of 1 of a cooling unit, even if the cooling object of 1 breaks down, the fall of refrigeration capacity can be prevented.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] this invention relates to the electronic instrument of the cooling structure equipped with the redundant configuration of cooling.

[0002] A magnetic disk unit is used as external storage which makes the system file and data file of recent years, for example, an electronic computer system, memorize, and a magnetic disk unit is being enlarged from increase of storage capacity. Therefore, if the temperature in a magnetic disk unit rises unusually, it is necessary to cool by damaging a head disk assembly (HDA), a control circuit, a power supply, etc.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] The block diagram of the fan unit attachment structure of the conventional magnetic disk unit is shown in drawing 8 :

[0004] Two or more magnetic disk units 11 shown in drawing 8 are carried according to scales, such as HDA, a control circuit substrate, and a power supply, in the housing 12, the breaker 13 for two or more protection is arranged at the bottom of a housing 12, and two or more power supplies 14 are arranged on a breaker 13. Fan unit 151 equipped with the cooling fan for cooling the power supply 14 concerned on a power supply 14 Predetermined-number arrangement is carried out.

[0005] Fan unit 151 Two or more control circuit [upper part] substrate 161 It sets in each stage in three steps, and is two or more HDA171. Fan unit 152 for being arranged and cooling these on this It is arranged. Fan unit 152 In the upper part, it is one step of HDA172. Connector 181 for connection with host equipment While being arranged, it is the control circuit substrate 162 of plurality [upper part / this]. It sets in each stage in three steps, and is two or more HDA173. It is arranged and is the fan unit 153 of plurality / top / these]. It is arranged.

[0006] And fan unit 153 In the upper part, it is a connector 182. One step of HDA174 It is arranged.

[0007] On the other hand, it is the composition of a field, and is arranged with the same composition also as an opposite side, and drawing 8 is [which detaches and attaches HDA17 and the control circuit substrate 16] the fan unit 151-153. From rotation, cooling air flows caudad from the equipment upper part, and cools HDA 171-174, the control circuit substrate 161, 162, and a power supply 14.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, according to invention of claims 1-3, by preparing two or more stowages which contain other cooling units at the time of exchange of the cooling unit concerned in a cooling unit in the circulation direction of a cooling medium to the cooled section, cooling of the cooled section by the cooling unit is made to continue, exchange is performed, and the fall of refrigeration capacity can be prevented.

[0056] According to invention of a claim 4, a stowage can be easily prepared to the composition section of equipment by two or more stowages' fastening the cooled section in the circulation direction of a cooling medium, and preparing them.

[0057] According to invention of a claim 5, invasion of the dust from a receipt mouth can be prevented at the time of un-containing [of a cooling unit] by preparing in a stowage the covering device which closes a receipt mouth at the time of un-containing [of a cooling unit].

[0058] According to invention of a claim 6, a cooling unit can be easily contained to a stowage by making electrical installation perform free [attachment and detachment] by the 1st bond part prepared in the stowage, and the 2nd bond part prepared in the cooling unit.

[0059] According to invention of a claim 7, the exchange part of a cooling unit can be easily checked by preparing the display which displays failure of a cooling object on a cooling unit. According to invention of a claim 8, by preparing the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of 1 of a cooling unit, even if the cooling object of 1 breaks down, the fall of refrigeration capacity can be prevented.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, fan unit 151-153 It must exchange for the life by wear of a bearing etc., or failure, in order to make it stop at the time of failure and exchange, the capacity of cooling of equipment declines, and the cooling fan to constitute is HDA 171-174, the control circuit substrate 161, and 162. And there is a problem that there are damage and a case where life shortening is carried out, about power supply 14 grade.

[0009] By the way, although the thing of the redundant configuration which is the thing of another side and compensates one failure with two cooling fans in preparation for a fan unit as a method of making other cooling fans operating and preventing the fall of refrigeration capacity is known to failure of a cooling fan, at the time of exchange of a fan unit, a normal cooling fan will also be exchanged in this case, and since it is made to stop, there is a problem of causing the fall of refrigeration capacity.

[0010] Then, this invention was made in view of the above-mentioned technical problem, and it aims at offering the electronic instrument of the cooling structure which makes a cooling unit exchangeable, without reducing refrigeration capacity.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, in the electronic instrument of the cooling structure where the cooling unit of the predetermined number equipped with the cooling object which cools to the cooled section has been arranged, the electronic instrument of the cooling structure characterized by preparing two or more stowages which contain the aforementioned cooling unit to the aforementioned cooled section consists of claims 1.

[0012] In a claim 2, other cooling units are contained in the stowage of others. [stowages / two or more / according to claim 1 / time / of exchange of the aforementioned cooling unit].

[0013] In a claim 3, two or more stowages according to claim 1 or 2 are prepared in the circulation direction of the cooling medium of the aforementioned cooling unit at intervals of predetermined.

[0014] In a claim 4, two or more stowages according to claim 3 fasten the aforementioned cooled section, and are prepared.

[0015] In a claim 5, the covering device with which two or more stowages given in any 1 term of claims 1-4 close a receipt mouth at the time of un-containing [of the aforementioned cooling unit] is prepared.

[0016] In a claim 6, the 1st coupling means which perform the aforementioned cooling unit and electrical installation to each of two or more stowages given in any 1 term of claims 1-5 are prepared, and these 1st coupling means and the 2nd coupling means which perform electrical installation free [attachment and detachment] are prepared in this cooling unit.

[0017] In a claim 7, the display as which a cooling unit according to claim 1 displays it at the time of failure of the aforementioned cooling object is prepared.

[0018] In a claim 8, two or more aforementioned cooling objects which can be set to a cooling unit according to claim 1 or 7 are established, and the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of at least 1 are prepared.

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OPERATION

[Function] As mentioned above, in invention of claims 1-3, two or more stowages which contain other cooling units at the time of exchange of the cooling unit concerned are prepared in the circulation direction of a cooling medium in a cooling unit to the cooled section. By this, cooling of the cooled section by the cooling unit is made to continue, exchange is performed, and it becomes possible to prevent the fall of refrigeration capacity.

[0020] In invention of a claim 4, two or more stowages fasten the cooled section in the circulation direction of a cooling medium, and are prepared. This becomes possible to prepare a stowage easily to the composition section of equipment.

[0021] In invention of a claim 5, the covering device which closes a receipt mouth at the time of un-containing [of a cooling unit] is prepared in a stowage. This becomes possible to prevent invasion of the dust from a receipt mouth at the time of un-containing [of a cooling unit].

[0022] Invention of a claim 6 is made to perform electrical installation free [attachment and detachment] by the 1st bond part prepared in the stowage, and the 2nd bond part prepared in the cooling unit. This becomes possible to contain a cooling unit easily to a stowage.

[0023] In invention of a claim 7, the display which displays failure of a cooling object on a cooling unit is prepared. This becomes possible to check the exchange part of a cooling unit easily.

[0024] In invention of a claim 8, the control means which increase the cooling drive of other cooling objects at the time of failure of the cooling object of 1 of a cooling unit are prepared. Thereby, even if the cooling object of 1 breaks down, it becomes possible to prevent the fall of refrigeration capacity.

[0025]

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EXAMPLE

[Example] The block diagram of one example of this invention is shown in drawing 1. Drawing 1 (A) is the transverse-plane block diagram of the magnetic disk unit as an electronic instrument of cooling structure, and drawing 1 (B) is a flank block diagram. On the other hand, in a field, predetermined-number-arrangement of the breaker 23 for electrical power system protection is carried out at the bottom of a housing 22, and, as for the magnetic disk unit 21 shown in drawing 1 (A), predetermined-number arrangement of the power supply 24 which is the cooled section is carried out in the upper part.

According to the scale, a number proper setup of a breaker 23 and the power supply 24 is carried out.

[0026] On a power supply 24, two steps of stowages 25a and 25b are formed successively by lengthwise [which is the circulation direction of a cooling medium], and predetermined-number arrangement of these two stowages 25a and 25b is carried out horizontally. And the cooling unit 26 (it explains in drawing 3) is contained by either of each stowages 25a and 25b for example, at stowage 25a.

[0027] Moreover, the control circuit substrate 27 which is the cooled section of a predetermined number above the stowages 25a and 25b, and HDA28 (it explains in drawing 4) which is the cooled section of a predetermined number horizontally in three steps are arranged. Besides, two stowages 25a and 25b are established in lengthwise, predetermined-number arrangement of these is carried out horizontally, and the cooling unit 26 is contained by the section at each stowage 25a.

[0028] Furthermore, in the direction of these stowages 25a and 25b, HDA28 of a predetermined number is horizontally arranged in one step with the main connector 29 which is the cooled section for connecting with host equipment.

[0029] Similarly, the control circuit substrate 27 of a predetermined number and HDA28 are arranged in the main connector 29 and each upper part of HDA28, and while the stowages 25a and 25b where the cooling unit 26 was contained by the upper part at one side are arranged, the main connector 29 and HDA28 are arranged further in the upper part.

[0030] For example, at this example, in the power supply 24 of four trains, and each stage, horizontally, it is configured by the control circuit substrate 27 of four trains (12 sheets) in the stowages 25a and 25b of three trains, and each stage, and is configured in each stage HDA28 of six trains, respectively.

[0031] As shown in drawing 1 (B), by the way, to a part for the abbreviation center section of a housing 23 Six back panels 30 (30a1, 30a2, 30b1, 30b2, 30c1, 30c2) are arranged. a back panel 30a1 and 30a2 **** -- the connector (female side) which performs electrical installation with the cooling unit 26 and plug-in within a power supply 24 and stowage 25a, and 25b is prepared, respectively (it mentions later) other back panels 30b1, 30b2, 30c1, and 30c2 **** -- the cooling unit 26, the control circuit substrate 27, HDA28, the main connector 29, and the connector (male side) that performs electrical installation with plug-in are prepared, respectively [moreover,]

[0032] That is, on the other hand, the thing to a field (drawing 1 (A)) and the thing to an another side side are prepared, the thing of the same composition as drawing 1 (A) is arranged in an another side side, and a back panel 30 has a magnetic disk unit 21 constituted.

[0033] Here, the block diagram of the back panel of drawing 1 is shown in drawing 2. It is what showed the back panel 30b1 (the same except 30a1 and 30a2) of drawing 1, the connectors (female side) 31a

and 31b which are the 1st coupling means of every each stowage 25a corresponding to the cooling unit 26 and 25b are horizontally formed in three trains in two steps, and, as for drawing 2, the connector (female side) 32 (three-step four trains) corresponding to the control circuit substrate 27 is formed. The connector (female side) 33 corresponding to HDA28 of three-step six trains is formed near the connector 32. Furthermore, the connector (female side) 34 corresponding to the main connector 29 and the connector (female side) 33 corresponding to HDA28 of one-step six trains are formed in connector 31a and 31b upper part.

[0034] That is, electrical installation is performed for the cooling unit 26, the circuit board 27, HDA28, a main connector, etc. to these connectors by plug-in.

[0035] Then, the block diagram of the cooling unit of drawing 1 is shown in drawing 3. The connector (male side) 42 whose fans 26a and 26b whose cooling units 26 shown in drawing 3 are two cooling objects in a frame 41 are the 2nd coupling means which it was arranged at the coplanar and contact pin 42a projected to the inner is formed. Electrical connection of the attachment and detachment of a connector 42 is made free to Connectors 31a and 31b. For example, DC brushless motor is used and, as for Fans 26a and 26b, speed control is suitably performed by the control section (it mentions later).

[0036] Moreover, while Light Emitting Diode (light emitting diode) 43 which is the display which displays at the time of which fans' 26a and 26b failure was formed, when it contains to Stowages 25a and 25b, it escapes in the front face of a frame 41, and the stopper section 44 for prevention is formed in it. In addition, the wiring 45a and 45b of Fans 26a and 26b is connected to contact pin 42a of a connector 42 along with a frame 41.

[0037] This cooling unit 26 forms two fans 26a and 26b as a redundant configuration. For example, by rotating fan 26b of another side at the time of failure, or rotating one fan 26a, carrying out low-speed rotation of the two fans 26a and 26b, and considering another side as high-speed rotation at the time of one failure The fall of the refrigeration capacity in the equipment at the time of one failure is prevented. In addition, control of a redundant configuration is explained in drawing 6 and drawing 7.

[0038] Moreover, the block diagram of HDA of drawing 1 is shown in drawing 4. drawing 4 -- setting -
- HDA -- 28 -- a pedestal -- 46 -- a top -- a rolling mechanism -- rotating -- a record medium -- a magnetic disk -- and -- record -- the reproducing head -- having carried -- an actuator -- a mechanism -- having -- disk enclosure -- (-- DE --) -- 47 -- fixing -- having -- while -- a drive -- an electrical power system -- conversion -- carrying out -- a converter -- 48 -- fixing -- having .

[0039] The connector 49 which carries out plug-in to the connector 33 of a back panel 30, and performs electrical installation to a part for the inner of a pedestal 46 is formed, and the ejector 51 when taking out the predetermined drops (for example, an error message, a preparation display, etc.) 50 and this HDA28 from a housing 22 into the front portion of an opposite portion is formed.

[0040] Then, the block diagram of the stowage of drawing 1 is shown in drawing 5. In drawing 5, it will be in the state where the amount of the inner is a back panel 30, and Connectors 31a and 31b projected Stowages 25a and 25b inside. Moreover, the covering devices 53a and 53b which can be rotated freely are attached to Shafts 52a and 52b, and a front portion is energized in the direction in which covering devices 53a and 53b close a receipt mouth with Springs 54a and 54b. This has prevented the invasion of the dust to stowage 25b by which the cooling unit 26 is not contained. Furthermore, as for Stowages 25a and 25b, opening 55 is formed in the field (the upper surface and base) where lengthwise (the circulation direction of cooling air) counters.

[0041] In drawing 5, it is in the state which contained the cooling unit 26 to stowage 25a, and covering device 53a has been pushed up and the front portion of the cooling unit 26 will be in the state where it displayed from the receipt mouth of stowage 25a. At this time, connector 31a of a back panel 30 and the connector 42 of the cooling unit 26 will be in an integrated state, and electrical installation is performed.

[0042] In such a state, it is the redundant configuration which is made to carry out high-speed rotation of the normal fan 26b of another side, and aims at maintenance of refrigeration capacity if one fan 26a breaks down while [when two fans 26a and 26b are operated normally (low-speed rotation), for example,] Light Emitting Diode 43 will light up. And after making stowage 25b contain the normal cooling unit 26 and making it operate, it can exchange easily by stopping and taking out the current

supply to the cooling unit 26 which has failure fan 25a, without reducing refrigeration capacity.

[0043] Then, a fan's redundant circuit block diagram is shown in drawing 6 . In the redundant circuit 61 shown in drawing 6 , Fans' 26a and 26b rotation signal is inputted into the rotation pulse detector 62, and the pulse detected here is inputted into a counting circuit 63. The enumerated data of a counting circuit 63 is inputted into a comparator circuit 64, and compares a reference value by the comparator circuit 64. In this case, as for a counting circuit 63 and a comparator circuit 64, only the time set up by the timer 65 performs counting and comparison.

[0044] The comparison result of a comparator circuit 64 is sent to the roll control circuit 66, and when one fan 26a (26b) has produced failure, Light Emitting Diode43 of the cooling unit 26 concerned is made to turn on through the status-display circuit 67, and a roll control signal is sent out in the roll control circuit 66 so that rotation of normal fan 26b (26a) may be raised.

[0045] Here, the flow chart of redundant circuit operation of drawing 6 is shown in drawing 7 , and it explains to it with drawing 6 . In drawing 6 and drawing 7 , first, as shown in drawing 5 , the cooling unit 26 is contained by stowage 25a, both two fans 26a and 26b are operated by low-speed rotation, each rotation signal of each fans 26a and 26b at this time is inputted into the rotation pulse detector 62, and detection of a rotation pulse is performed (Step 1 (S)).

[0046] And counting of the detected rotation pulse is carried out by the counting circuit 63 (S2), and the enumerated data is compared with a reference value (criteria rotational frequency) by the comparator circuit 64. in this case, the timer 65 -- a counting circuit 63 -- fixed time (for example, 1 second) -- counting -- it is made to operate and comparison operation is carried out by the comparator circuit 64 after fixed time progress

[0047] Then, in a comparator circuit 64, when predetermined time has not passed, it returns to S1, and when having passed, an enumerated data is compared with a reference value about each of Fans 26a and 26b (S3). When both rotation pulse numbers are beyond predetermined values as a result of comparison, which fans 26a and 26b are normal, and pulse detection of the rotation pulse detector 62 is continued (S4).

[0048] Here, since the rotational frequency of fan 26a will fall supposing it produces failure in fan 26a, in a comparator circuit 64, the enumerated data of a detection pulse becomes smaller than a reference value, and the result is sent to the roll control circuit 66 (S4).

[0049] In the roll control circuit 66, Light Emitting Diode43 is made to turn on through the status-display circuit 67 by making normal fan 26b into high-speed rotation mode, and an obstacle fan is displayed (S7). Fan 26b sends out the signal of the purport which should indicate by alarm to high order equipment, when failure arises in high-speed rotation mode (S6).

[0050] Then, if Light Emitting Diode43 lights up, after making stowage 25b contain the cooling unit 26 equipped with the normal fans 26a and 26b as mentioned above and operating, it exchanges by removing the cooling unit 26 equipped with fan 26a which failure produced.

[0051] And even if the above thing is repeated on stream and a magnetic disk unit 21 has an obstacle to Fans 26a and 26b, the cooling unit 26 can be exchanged easily, without reducing refrigeration capacity.

[0052] In addition, when working by making it stop at the time of the scheduled maintenance of a magnetic disk unit 21, you may contain the cooling unit 26 to exchange to the same stowages 25a and 25b.

[0053] By the way, although the above-mentioned example shows the case where made Stowages 25a and 25b approach, and they are prepared, a predetermined distance may be had and established, and the control circuit substrate 27 and where HDA28 is fastened, you may prepare.

[0054] Moreover, although the above-mentioned example showed the case where it applied to a magnetic disk unit 21, it is applicable to the required electronic instrument of not only this but cooling.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of one example of this invention.

[Drawing 2] It is the block diagram of the back panel of drawing 1.

[Drawing 3] It is the block diagram of the cooling unit of drawing 1.

[Drawing 4] It is the block diagram of HDA of drawing 1.

[Drawing 5] It is the block diagram of the stowage of drawing 1.

[Drawing 6] It is a fan's redundant circuit block diagram.

[Drawing 7] It is the flow chart of redundant circuit operation of drawing 6.

[Drawing 8] It is the block diagram of the fan unit attachment structure of the conventional magnetic disk unit.

[Description of Notations]

21 Magnetic Disk Unit

22 Housing

23 Breaker

24 Power Supply

25a, 25b. Stowage

26 Cooling Unit

26a, 26b Fan

27 Control Circuit Substrate

28 HDA

29 Main Connector

31a, 31b Connector (female side)

42 Connector (Male Side)

43 LED

47 DE

48 Converter

49 Connector (Male Side)

52a, 52b Shaft

53a, 53b Covering device

54a, 54b Spring

55 Opening

61 Redundant Circuit

62 Rotation Pulse Detector

63 Counting Circuit

64 Comparator Circuit

65 Timer

66 Roll Control Circuit

67 Status-Display Circuit

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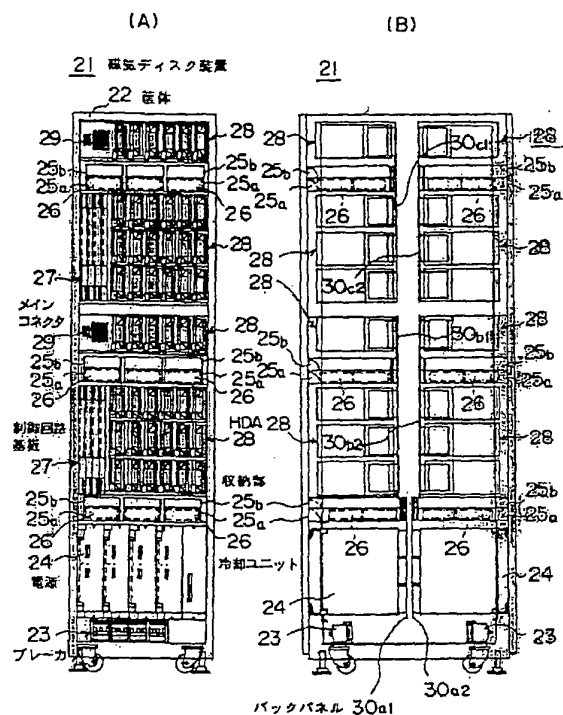
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DRAWINGS

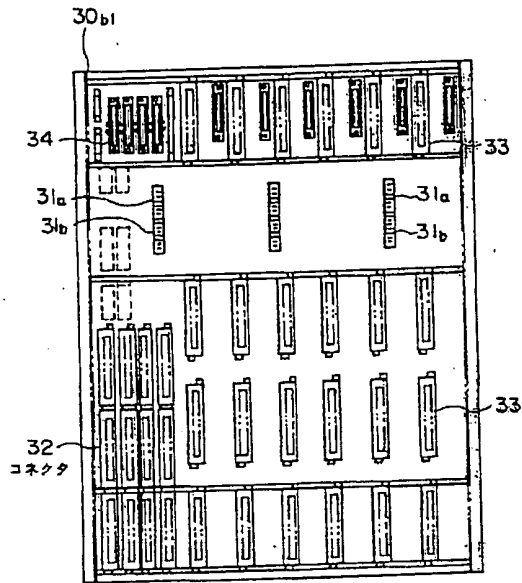
[Drawing 1]

本発明の一実施例の構成図



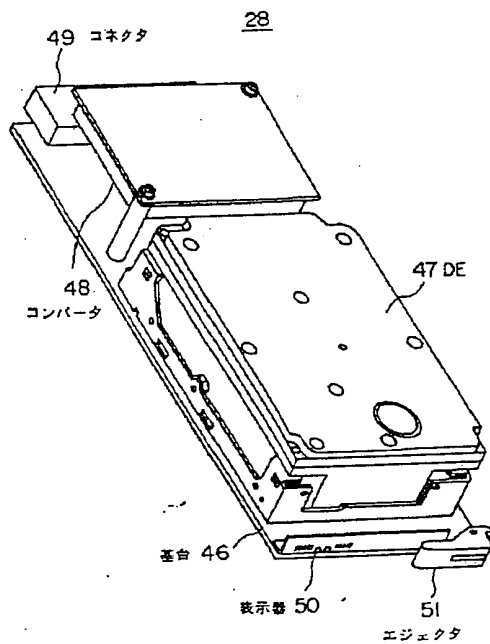
[Drawing 2]

図1のバックパネルの構成図



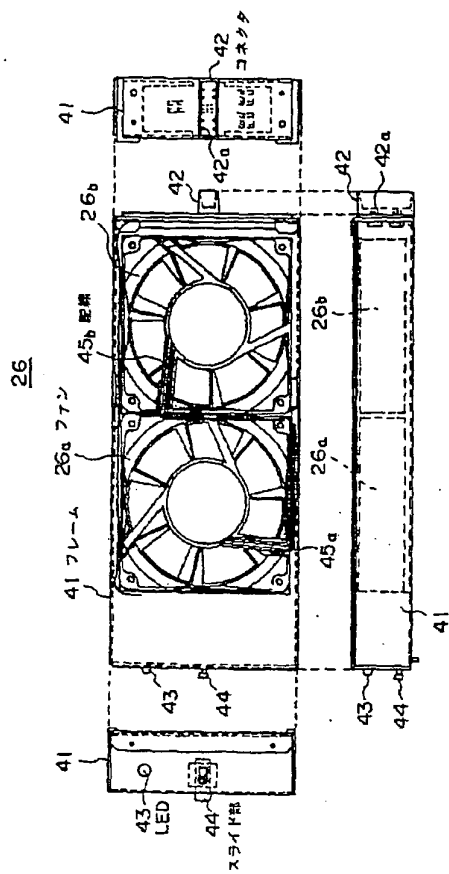
[Drawing 4]

図1のHDAの構成図



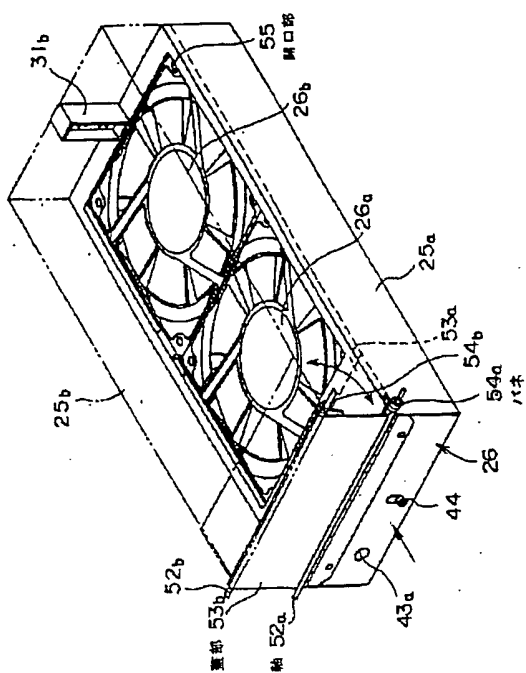
[Drawing 3]

図1の冷却ユニットの構成図



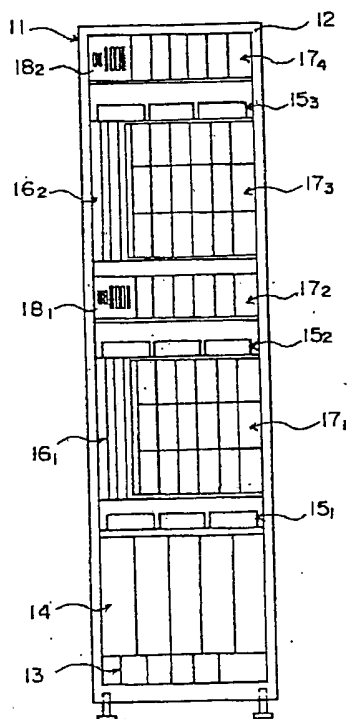
[Drawing 5]

図1の収納部の構成図



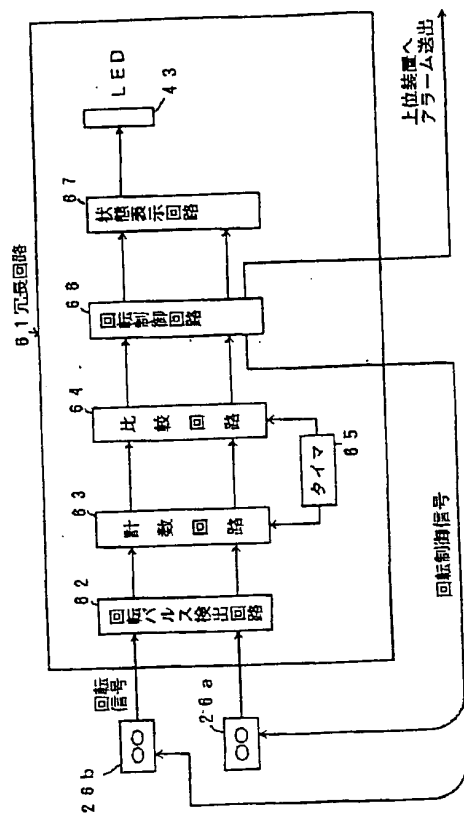
[Drawing 8]

従来の磁気ディスク装置のファンユニット取付構造の構成図



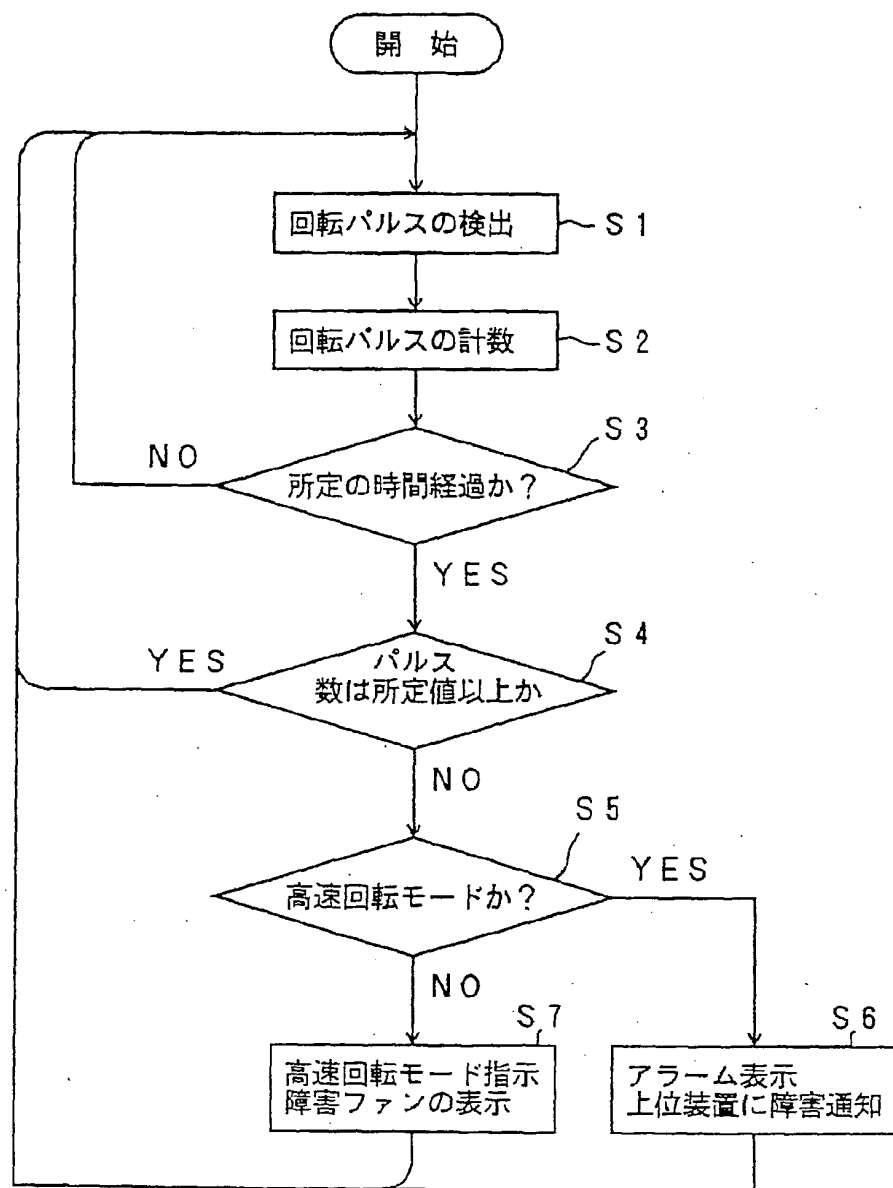
[Drawing 6]

ファンの冗長の回路ブロック図



[Drawing 7]

図 6 の冗長回路動作のフローチャート



[Translation done.]